

## Tunnels & Shaft Solutions

FP McCann manufactures a comprehensive range of smoothbore shaft and tunnel linings. Each size is specifically designed to meet the tunnelling industry's exacting and varied needs, recognising the key criteria as being strength, stability and the capability of performing in all types of ground conditions.

### Design Features

All rings, with the exception of the cutter choker comprise of ordinary segments and two top segments. The top segments have one tapered cross joint in order that they can be installed with EPDM gasket. The cutter choker comprises all ordinary segments.

### Sealing

FP McCann are the only precast concrete manufacturer to supply pre-fitted, tailor made EPDM rubber gaskets on the complete range of smoothbore shaft and tunnel linings. The gaskets provide an immediate water tight seal on construction and are fully compliant with the requirements of the British Tunnelling Society specification. Speed of build, safety and increase in site productivity are key benefits.

### Connection

Cross joint connections are made using a spear bolt passing through a pocket in one segment and a plastic socket in the adjacent segment. Circle joint connections are made using a T bolt passing through a hole in one segment and into a T box in the adjacent segment. Bolts are designed to fully compress the gasket. All connections are sheradised. (Other finishes to fittings, including galvanised, are available on request). Additionally, FP McCann offer a safer and more efficient back bolting system for the caisson build method.

### Ring Types

Segmental ring types provided by FP McCann:  
Segmental rings in stock are front or back bolted.

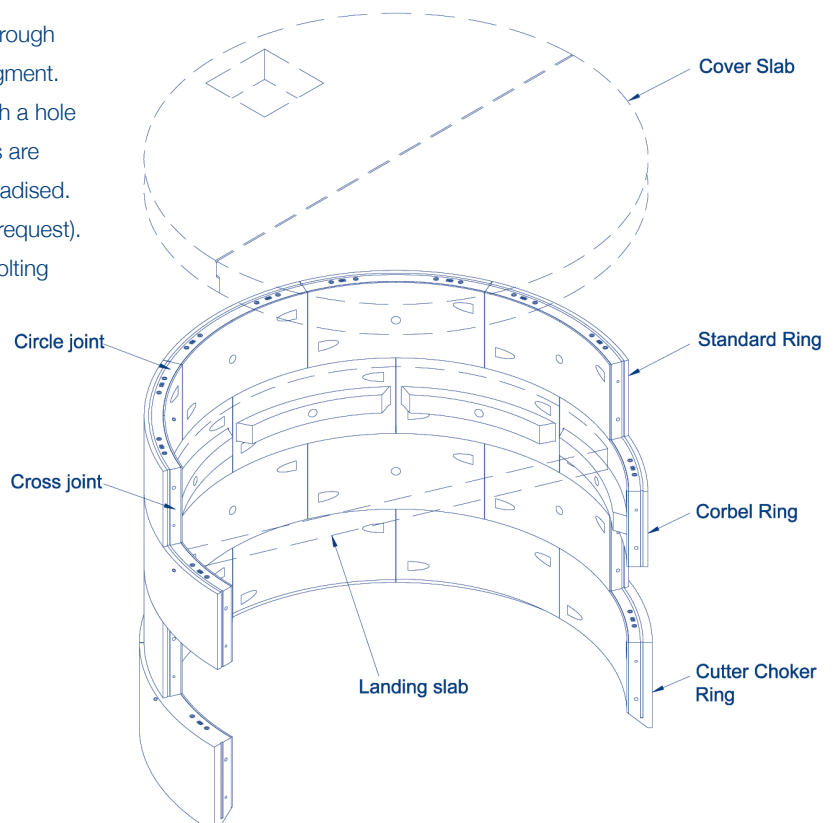
1. Standard rings
2. Corbel rings
3. Recessed rings (standard, choker or cutter choker)
4. Choker rings
5. Combined cutter choker rings

### Mix and reinforcement

Each segment is wet cast to achieve a smooth internal finish. The concrete mix provides a Design Chemical Class 4 (DC4) with a minimum 28 day characteristic strength of 55 N/mm<sup>2</sup>. Alternative mixes are available. The segments are reinforced with either a reinforcing cage or structural synthetic and steel fibres to suit both design and customer requirements.

### Build Methods

The segmental rings are suitable for underpinning, caisson and chimney construction methods.

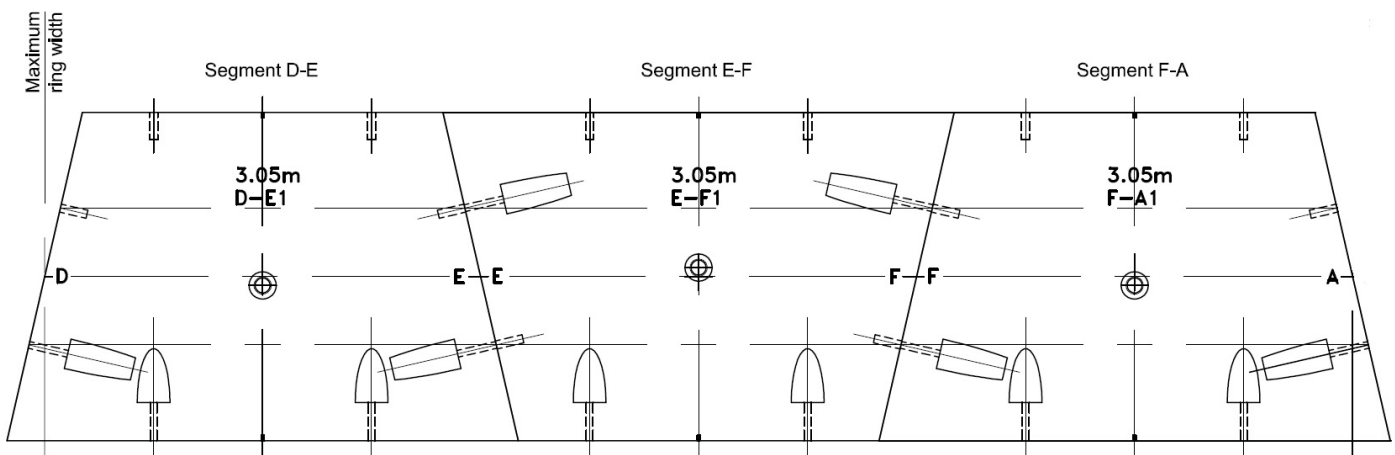


# smoothbore tunnel linings

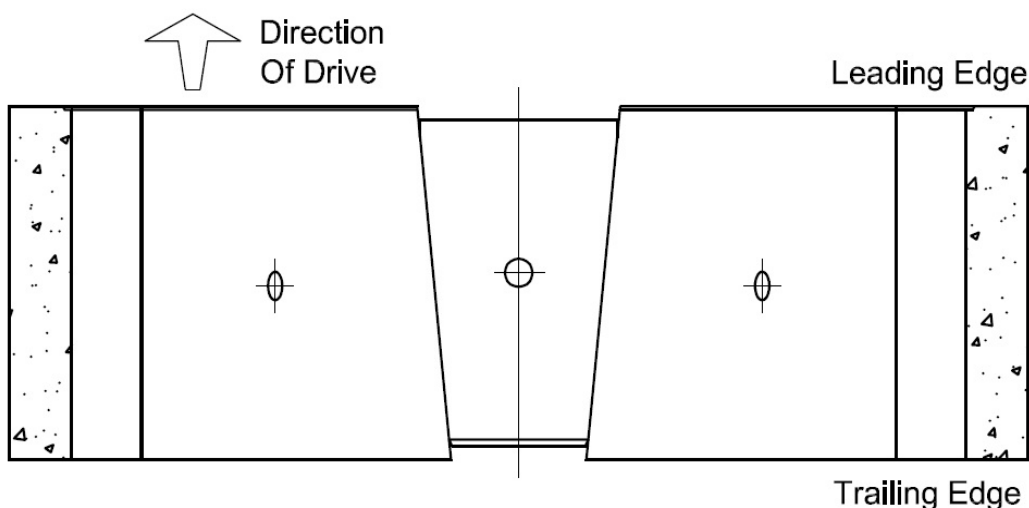
FP McCann design and manufacture a bespoke range of both Trapezoidal and Expanded Segmental Smoothbore tunnel linings, designed to provide durability, speed and ease of installation in tunnel construction. Trapezoidal tunnel linings are developed to work alongside technologically advanced tunnel boring machines, with linings designed and manufactured to suit exacting project requirements.

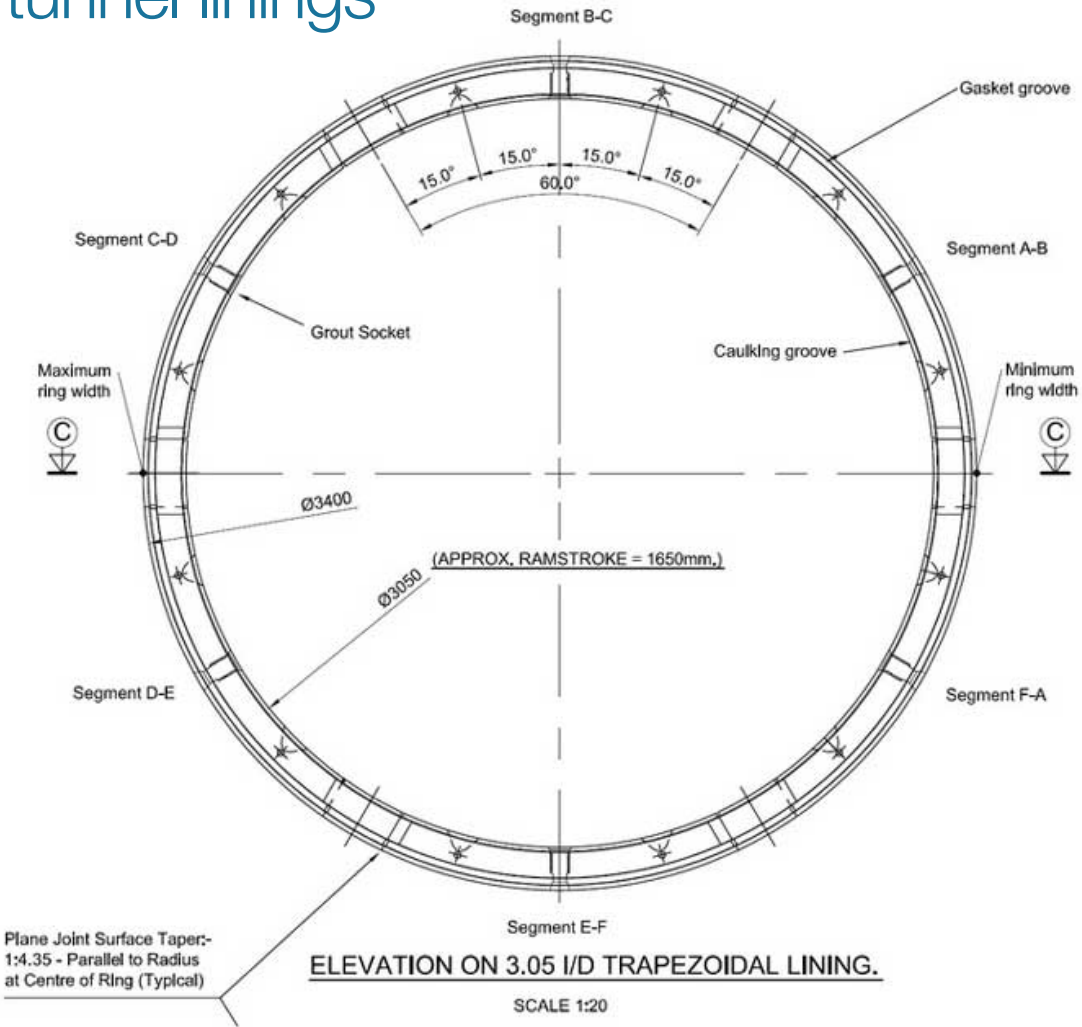
Tunnel segments can be modified to suit a variety of joint fixings, segment thickness and tunnel diameter's. The latest manufacturing techniques incorporate steel fibre dosing to guarantee a high quality, reliable product. The wedge shape design of individual segments eliminates the requirement for a special closure segment.

## Trapezoidal Segment



## Expanded Lining





Trapezoidal Tunnel Linings

Size				Segments per ring	Vol per ring (m3)	Wt per ring* (tonnes)	Maximun piece weight* (kg)
Internal diameter (m)	External diameter (m)	Max Ring Width (m)	Min Ring Width (m)				
2.440	2.800	0.990	1.010	6	1.48	3.70	617
2.850	3.200	1.010	0.99	6	1.66	4.32	698
3.050	3.400	1.211	1.189	6	2.13	5.32	893
4.000	4.450	0.975	1.025	8	2.99	7.47	933

Expanded Tunnel Linings

Size			Segments per ring			Vol per ring (m3)	Weight per ring* (tonnes)
Internal diameter (m)	External diameter (m)	Ring Width (m)	Ord	Top	Key		
2.590	2.950	1.000	5	2	1	1.57	3.92
3.050	3.400	1.200	5	2	1	2.13	5.32

\*Nominal weights increase by 5% for sizing of lifting equipment and reduce by 5% for flotation design.